

## CLAIMS

What is claimed is:

1. A code division multiple access user equipment for use in receiving a plurality of data signals received over a shared spectrum, each received data signal experiencing a similar channel response, the user equipment comprising:

means for receiving a combined signal of the received data signals over the shared spectrum;

means for sampling the combined signal at a multiple of a chip rate of the data signals;

means for estimating a channel response for the combined signal at the multiple of the chip rate;

means for determining a cross correlation matrix using the estimated channel response;

means for selecting a subblock of the cross correlation matrix;

means for determining a Cholesky factor for the subblock;

means for extending the Cholesky factor;

means for determining the spread data vector using the extended Cholesky factor, a version of the channel response and the samples; and

means for estimating data of the data signals using the spread data vector.

2. The user equipment of claim 1 wherein the channel response is estimated as a channel response matrix and the cross correlation matrix is the hermetian of the channel response matrix multiplied by the channel response matrix.

3. The user equipment of claim 2 wherein the multiple is twice the chip rate sampling, the channel response matrix has even matrix samples  $H_1$  and odd matrix samples  $H_2$ .

4. The user equipment of claim 3 wherein the multiple is N-times the chip rate sampling, the channel response matrix has N sets of matrix samples,  $H_1, H_2, \dots H_N$ .

5. The user equipment of claim 1 wherein the subblock has  $2W - 1$  by  $2W - 1$  elements of the cross correlation matrix and W is a length of the impulse response.

6. The user equipment of claim 1 wherein the determining the spread data vector uses forward and backward substitution.

7. A code division multiple access user equipment for use in receiving a plurality of data signals received over a shared spectrum, each received data signal experiencing a similar channel response, the user equipment comprising:

an antenna for receiving a combined signal of the received data signals over the shared spectrum;

a sampling device for sampling the combined signal at a multiple of a chip rate of the transmitted data signals;

a channel estimation device for estimating a channel response for the combined signal at the multiple of the chip rate; and

a single user detection device for determining a cross correlation matrix using the estimated channel response, for selecting a subblock of the cross correlation matrix, for determining a Cholesky factor for the subblock, for extending the Cholesky factor and for determining the spread data vector using the extended Cholesky factor, a version of the channel response and the samples; and

wherein data of the data signals is estimated from the spread data vector.

8. The user equipment of claim 7 wherein the channel response is estimated as a

channel response matrix and the cross correlation matrix is the hermetian of the channel response matrix multiplied by the channel response matrix.

9. The user equipment of claim 8 wherein the multiple is twice the chip rate sampling, the channel response matrix has even matrix samples  $H_1$  and odd matrix samples  $H_2$ .

10. The user equipment of claim 8 wherein the multiple is N-times the chip rate sampling, the channel response matrix has N sets of matrix samples,  $H_1, H_2, \dots H_N$ .

11. The user equipment of claim 7 wherein the subblock has  $2W - 1$  by  $2W - 1$  elements of the cross correlation matrix and  $W$  is a length of the impulse response.

12. The user equipment of claim 7 wherein the determining the spread data vector uses forward and backward substitution.